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## LONGITUDINAL CUTTER WITH A VERTICALLY DISPLACEABLE BLADE AND COUNTER-ROLLER

The present invention relates to a longitudinal cutter, whereas the longitudinal cutter consists of a blade and a counter-roller. Further, the present invention relates to a packaging machine which is used to produce several packagings and or through-shaped packaging elements from a packaging film and which can be separated from each other by means of a longitudinal and a transversal cutter, whereas the longitudinal cutter consists of a blade and a counter-roller.

These days, food is often provided in plastic packagings to increase their endurance. Normally, the packagings consist of a so called through-shaped packaging element, which contains the food and which is closed by a packaging film. Usually, the through-shaped packaging elements are drawn deep, whereas several through-shaped packaging elements can be parallel arranged regarding to the transfer direction of the film. These through-shaped packaging elements are either filled with the packaging good, sealed with a cover film and separated or the through-shaped packaging elements are directly unfilled separated after their production. The Separation of the finished packagings or of the through-shaped packaging elements is carried out by at least one longitudinal and a transversal cutter, whereas the longitudinal cutter is responsible for the cut in the running direction of the film and the transversal cutter is responsible for the cut transversal to the running direction of the film.

Today, packaging machines can be operate with a plurality of different tools, in particular with deep drawing and sealing tools with different designs of the through-shaped packaging elements and formats, i.e. the number and the structure of the through-shaped packaging elements, deep drawn and/or sealed in a cycle. At a change of these tools, the parameters of the machine and the following tools respectively have to adjust correspondingly. Up to now, this was not possible with the longitudinal cutters according to the related prior art.

Therefore, the object of the present invention is to provide a longitudinal cutter not showing the disadvantages of the prior art.

The object is solved by a longitudinal cutter according to claim 1. Preferable embodiments of the longitudinal cutter according to the present invention are claimed in the depended claims 2 to 5.

For the person skilled in the art it was surprisingly and not expected that the longitudinal cutter of the invention can be used in a very flexible manner. The longitudinal cutter according to the invention can be easily and reasonably produced and operated. In a change of the format, not more and additional longitudinal cutter respectively are vertically lowered or lifted, so that the rearrangement to new formats with the longitudinal cutter according to the invention is very easy. The longitudinal cutter according to the invention cleaves films very efficient.

According to the invention, the longitudinal cutter has a blade and a counter-roller which interacts with the blade. Between the blade and the counter-roller the film is slit and/or pressed apart.

According to the invention, the blade as well as the counter-roller are preferably rotative driven and respectively vertically displaceable. Vertically displaceable in terms of the invention means that the blade and the counter-roller can be moved away from the sheet and can be moved to the sheet respectively. It is not necessary that the movement must be a vertical movement but it has to show only a vertical component. For example, the blade and the counter-roller can be displaced respectively on a circular path or slap to up and down respectively and therefore displaced vertically also. Preferably, the blade is located above and the counter-roller is located below the film for cutting. The person skilled in the art takes for granted that also a reverse arrangement is possible. The blade and the corresponding counter-roller have not to vertical displaced synchronously. For example, it is thinkable that the counter-roller is vertically displaced as the position of the blade is retained unchanged. However, preferably the blade as well as the counter-roller is vertically displaced.

Preferably, the displacement of the blade and the counter-roller is carried out by a driving element. However, every element known by a skilled person for moving the blade and the counter-roller respectively which has a vertical component is considered as a driving element. For example, this can be an electric powered, a hydraulic or an electro linear cylinder. Further, the driving can also results from an electric motor with a corresponding gearbox.

Another subject-matter of the present invention is a packaging machine for producing through-shaped packaging elements or packagings from a packaging film, whereas with one longitudinal and one transversal cutter the packaging can be separated from each other with a cover film after filling and sealing or the through-shaped packaging elements can be separated before filling, and the packaging machine has at least one longitudinal cutter according to the present invention.

For the person skilled in the art it was surprisingly and not expected that the packaging machine according to the invention is adjustable in a very flexible manner respectively to the produced packaging formats. The packaging machine of the invention can be easily and reasonably produced and operated. Thus, that the blade as well as the counter-roller are driven the film webs for producing the through-shaped packaging elements and/or the cover foil can be cut in nearly any composition and thickness.

Preferably, three or more through-shaped packaging elements as the case may be packagings are parallel produced with the packaging machine according to the present invention, e.g. transversal to the running direction. Correspondingly, the packaging machine according to the present invention has at least two longitudinal cutters whose blades and counter-rollers are drivable and vertically displaceable respectively.

In a preferred embodiment the blades and the counter-rollers of a longitudinal cutter are separate driveable and/or separate displaceable. The advantage of this embodiment of the packaging machine according to the present invention is that the drivers and the respective vertical position of the blade and of the counter-roller can be totally adjusted, so that at a change of the format the blades as well as the corresponding counter-rollers can be individually separated in an engagement to each other or of each other.

In another embodiment of the packaging machine according to the present invention, the packaging machine has several blades and the blades and the counter-roller are at least partially driveable together and/or at least in part vertically displaceable together. The advantage of this embodiment of the packaging machine according to the present invention is that the blades as well as the counter-rollers can be moved in groups to the cutting position and out of the cutting position respectively.

Preferably, the drive and/or the vertical displacement of the blade and of the counter-roller respectively are carried out automatically due to the chosen design of the through-shaped packaging element and/or of the format. Format according to the present invention means the number of the through-shaped packaging elements, which can be incorporate in a parallel manner in the respective packaging film and then according to this must be cut apart with one or several longitudinal cutter(s).

The information about the format and the design of the packaging can be carried out by the user, for example via the display of the respective packaging machine connected with a computer that controls the packaging machine. In another embodiment of the packaging machine according to the present invention the tools, for example the deep drawing tool for forming the through-shaped packaging elements are having a data medium, for example a transponder, where data about the design of the through-shaped packaging elements and the respective format can be saved or read out, which is readable by a receiver of the packaging machine which is connected to a computer that is responsible for carry out the automatic setting of the longitudinal cutters. Depending on the design of the through-shaped packaging elements and/or on the driven format on the packaging machine, the packaging machine engages specific blades and their counter-rollers or moves them out of the cutting plane.

With references to FIGS 1 to 4, the invention will be illustrated below. These illustrations are merely by way of example and do not limit the general idea of the invention. The illustrations apply for the longitudinal cutter according to the invention and similar for the packaging machine according to the invention.

Fig.1 shows the design station of a packaging machine.

Fig.2 shows an embodiment of the longitudinal cutter of the invention.

Fig.3 shows another embodiment of the longitudinal cutter according to the invention, whereas the counter-rollers are vertically displaced together.

Fig.4 shows another embodiment of the longitudinal cutter of the invention according to Fig.3

In Fig.1 shows a part, the deep drawing station, of the packaging machine according to the invention. The film F1 is rolled up from a roll V1 and for example with a chain drive synchronized transported to the deep drawing station T as shown with the arrow. There, the film is fixed and heated with heating elements 18, whereas the heating of the film can also takes place before the deep drawing station. The deep drawing mould 19 for the deep drawing of the through-shaped packaging elements is located on a lifting device 20. As soon as the tool 19 is fixed on the lifting device, the data of a sensor chip which is located in the tool 19 are queried by a send-receive device (not shown). Thereafter, these data are processed in a computer. This computer controls the automatic setting of the longitudinal cutting device for example, so that the longitudinal cutting device is adapted to the design of the produced through-shaped packaging elements and to the format. The packaging film is rolled up in a synchronized manner and the through-shaped packaging elements are moulded in the packaging film. The tool 19 is formed that several but at least two through-shaped packaging elements are produced in the paper plane in series. The through-shaped packaging elements are transported out of the deep drawing station and then if necessary filled with a packaging commodity and sealed with a covering film. Subsequently, the produced packagings are cut apart in running direction by the longitudinal cutter shown in Fig. 2 to 4. The through-shaped packaging elements are divided transversal to the running direction by a transversal cutter (not shown). Also, it is thinkable that the longitudinal cutters according to the invention are used only in a so called trayformer. In such an embodiment the through-shaped packaging elements 21 are not filled after the deep drawing station but separated with longitudinal cutters according to the invention and a transversal cutter, and can be filled and sealed in a so called traysealer for example.

Fig.2 shows a longitudinal cutter according to the invention with a blade 2 and a counter-roller 3. The surface of the blade 2 presses against the cylinder 3 and cleaves the film (not shown) which is synchronized transported between the blade 2 and the counter-roller 3, as shown with the arrow "LR". The blade 2 and the counter-roller 3 are respectively driven by a driving element 5 and respectively 6, in the present case toothed wheels which are connected to a motor (not shown). Therefore, the tooth of the toothed wheel 5 engaged in the tooth of the toothed wheel 7 which is torque proof connected to the blade. The tooth of the toothed wheel 6 engaged in the tooth of the

toothed wheel 8 which is torque proof connected to the counter-roller. With the pneumatic cylinder 4, 9, the counter-roller and the blade respectively can be vertically displaced, whereas the toothed wheel 8 on the toothed wheel 6 and the toothed wheel 7 on the toothed wheel 5 are rolled up and therefore the counter-roller 5 and the blade 2 respectively can be moved to the film web.

Fig.3 shows another embodiment of the longitudinal cutter according to the invention. In the present case, the counter-rollers 3 are located on a common shaft 11 which can be driven, so that all of the longitudinal cutters are driven together. The person skilled in the art recognizes that the counter-rollers 3 can be also rotatable supported on the axis 11 and then have respectively or partly together a driving which is not shown. The counter-rollers 3 act together with the blades 2 which are respectively driven and which are vertically displaceable as shown with the double arrow 17. The shaft and respectively the axis 11 is lateral supported by the supports 10. In these supports a connecting link 12, in the present case a elongated hole, is located, which leads the shaft or axis 11 during the horizontal movement. The horizontal movement of the shaft / axis 11 is caused by the cylinders 4. The person skilled in the art recognizes that the shaft / axis 11 movement has not to range between the above and the below end point of the connecting link, but that in particular the down movement has to be only effected as far as it is given by the deepness of the through-shaped packaging elements.

Fig. 4 shows another embodiment of the longitudinal cutter according to the invention which basically corresponds to the longitudinal cutter according to Fig.3, whereas in the present case the shaft / axis 11 movement is not lead by the connecting link, but the shaft 11 is connected with a roll 14 which rolls up on a roll 13 that is connected to a shaft 16. The movement of the roll 13 is shown by a double arrow located in the roll. A belt 15 is pulling the roll 14 against the roll 13. The vertical displacement of the counter-roller is driven by the cylinders 4.

### **List of the reference numbers**

1	longitudinal cutter
2	blade
3	counter-roller
4	pneumatic cylinder
5	blade driver
6	counter-roller driver
7,8	tooth ring
9	pneumatic cylinder
10	support for shaft 11
11	connecting link
13, 14	roll
15	belt
16	shaft
17	double arrow
18	heating element
19	deep draw mould
20	lifting device
21	through-shaped packaging elements